the hull. A keel cooler is considered integral to the hull if the following conditions are satisfied:

(1) The cooler structure is fabricated from material of the same thickness and quality as the hull;

(2) The flexible connections are located well above the deepest subdivision draft;

(3) The end of the structure is faired to the hull with a slope no greater than 4 to 1; and

(4) Full penetration welds are employed in the fabrication of the structure and its attachment to the hull.

§ 182.425 Engine exhaust cooling.

(a) Except as otherwise provided in this paragraph, all engine exhaust pipes must be water cooled.

(1) Vertical dry exhaust pipes are permissible if installed in compliance with §§ 177.405(b) and 177.970 of this chapter.

(2) Horizontal dry exhaust pipes are permitted only if:

(i) They do not pass through living or berthing spaces;

(ii) They terminate above the deepest load waterline;

(iii) They are so arranged as to prevent entry of cold water from rough or boarding seas;

(iv) They are constructed of corrosion resisting material at the hull penetration; and

(v) They are installed in compliance with §§ 177.405(b) and 177.970 of this chapter.

(b) The exhaust pipe cooling water system must comply with the requirements of this paragraph.

(1) Water for cooling the exhaust pipe must be obtained from the engine cooling water system or a separate engine driven pump.

(2) Water for cooling the exhaust pipe, other than a vertical exhaust, must be injected into the exhaust system as near to the engine manifold as practicable. The water must pass through the entire length of the exhaust pipe.

(3) The part of the exhaust system between the point of cooling water injection and the engine manifold must be water-jacketed or effectively insulated and protected in compliance with §§ 177.405(b) and 177.970 of this chapter.

(4) Vertical exhaust pipes must be water-jacketed or suitably insulated as required by § 182.430(g).

(5) When the exhaust cooling water system is separate from the engine cooling water system, a suitable warning device, visual or audible, must be installed at the operating station to indicate any reduction in normal water flow in the exhaust cooling system.

(6) A suitable hull strainer must be installed in the circulating raw water intake line for the exhaust cooling system.

(c) Engine exhaust cooling system built in accordance with the requirements of ABYC Project P–1, ''Installation of Exhaust Systems for Propulsion and Auxiliary Machinery,'' will be considered as meeting the requirements of this section.

[CGD 85–080, 61 FR 986, Jan. 10, 1996; 61 FR 20557, May 7, 1996]

§ 182.430 Engine exhaust pipe installation.

(a) The design of all exhaust systems must ensure minimum risk of injury to personnel. Protection must be provided in compliance with § 177.970 of this chapter at such locations where persons or equipment might come in contact with an exhaust pipe.

(b) Exhaust gas must not leak from the piping or any connections. The piping must be properly supported by noncombustible hangers or blocks.

(c) The exhaust piping must be so arranged as to prevent backflow of water from reaching engine exhaust ports under normal conditions.

(d) An exhaust pipe discharge located less than 75 millimeters (3 inches) above the deepest load waterline must be installed with a means to prevent the entrance of water.

(e) Pipes used for wet exhaust lines must be Schedule 80 or corrosion-resistant material and adequately protected from mechanical damage.

(f) Where flexibility is necessary, a section of flexible metallic hose may be used. Nonmetallic hose may be used for wet exhaust systems provided it is especially adapted to resist the action of oil, acid, and heat, has a wall thickness sufficient to prevent collapsing or panting, and is double clamped where practicable.